

Claims

1. A method for fabricating a light-emitting diode of a surface emitting type in which a semiconductor layer is deposited on a crystal growth plane of a crystal growth substrate, comprising steps of:

a shaping process for forming at least one of an output plane and a reflection plane which contributes to luminous output of the device through polishing treatment, dicing treatment, and blasting treatment from the back surface of said crystal growth substrate; and

a finishing process for finishing said at least one of output plane and said reflection plane by further carrying out etching treatment.

2. A method for fabricating a light-emitting diode according to claim 1, wherein said shaping process comprises a taper part forming process for forming a taper plane, which inclines to said crystal growth plane of said crystal growth substrate, at least as a portion of said output plane or at least as a portion of said reflection plane.

3. A method for fabricating a light-emitting diode according to claim 2, wherein at least a portion of said taper part forming process comprises of a process for forming an approximately V-shaped dividing groove which divides a

semiconductor wafer comprising plural light-emitting diodes into each of said light-emitting diode.

4. A method for fabricating a light-emitting diode according to any one of claims 1 to 3, wherein peak luminous wavelength of said light-emitting diode is less than 470nm.

5. A method for fabricating a light-emitting diode according to any one of claims 1 to 4, wherein said crystal growth substrate is formed by using $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$) or silicon carbide (SiC).

6. A light-emitting diode of a surface emitting type in which a semiconductor layer is deposited on a crystal growth plane of a crystal growth substrate, wherein

said crystal growth substrate comprises at least one of an output plane and a reflection plane which contributes to luminous output of the device through a physical shaping process such as polishing treatment, dicing treatment and blasting treatment, and

a physically damaged layer which is formed on the surface of at least one of said output plane and said reflection plane and remains owing to friction and shock generated in said shaping process is removed.

7. A light-emitting diode according to claim 6, wherein a metal layer which has light-transparency to transmit light

to the luminous extracting side of said device is formed on said output plane.

8. A light-emitting diode according to claim 6 or 7, wherein a metal layer which reflects light to the luminous extracting side of said device is formed on said reflection plane.

9. A light-emitting diode according to any one of claims 6 to 8, wherein said crystal growth substrate is formed by using $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$) or silicon carbide (SiC).

10. A light-emitting diode according to any one of claims 6 to 9, wherein a taper plane which inclines to said crystal growth plane of said crystal growth substrate is formed at least as a portion of at least one of output plane or at least as a portion of said reflection plane.

11. A light-emitting diode of a surface emitting type in which a semiconductor layer is deposited on a crystal growth plane of a crystal growth substrate, comprising:

a taper plane which inclines to said crystal growth plane of said crystal growth substrate which is formed at least at a portion of the sidewall of said light-emitting diode,

wherein said taper plane is exposed to the surface side of said light-emitting diode at which a semiconductor crystal

layer and a positive electrode are formed, and

a physically damaged layer which is formed on the surface of said taper plane and remains owing to friction and shock generated in said taper part is removed.

12. A light-emitting diode according to claim 10 or 11 which is fabricated by dividing a semiconductor wafer comprising plural light-emitting diodes into each of said light-emitting diode, comprising:

a taper plane at least at a portion of the sidewall of said light-emitting diode,

wherein said taper plane is a portion of the plane of an approximately V-shaped dividing groove which divides the semiconductor wafer into each of said light-emitting diode.

13. A light-emitting diode according to any one of claims 6 to 12, wherein the peak luminous wavelength of said light-emitting diode is less than 470nm.

14. A method for forming an electrode in which an electrode is formed on a polished plane of a conductive semiconductor substrate which comprises a Group III nitride compound semiconductor and has already been polished comprising a step of:

etching process for carrying out dry-etching treatment to said polished plane of said semiconductor substrate before electrode forming process for forming an electrode on said

polished plane of said semiconductor substrate.

15. A method for forming an electrode according to claim 14, wherein said semiconductor substrate is formed by using an n-type $\text{Al}_x\text{Ga}_{1-x}\text{N}$ ($0 \leq x \leq 1$).

16. A method for forming an electrode according to claim 14 or 15, wherein depth of removing said polished plane through said dry-etching treatment is in a range from $0.1\mu\text{m}$ to $15\mu\text{m}$.

17. A method for forming an electrode according to claim 16, wherein depth of removing said polished plane through said dry-etching treatment is in a range from $0.2\mu\text{m}$ to $8\mu\text{m}$.